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and Smith commoner than *calendula* in Kerr Co. Attwater calls it a common migrant at San Antonio.

68. ***Regulus c. calendula***. RUBY-CROWNED KINGLET.—Common, except in the arid country around Camp Stanley where it was a surprise to see it at all.

69. ***Polioptila c. cærulea***. BLUE-GRAY GNATCATCHER.—One bird noted January 1 at Hot Wells, south of San Antonio.

70. ***Hylocichla guttata*** subsp.? HERMIT THRUSH.—Rather common, except at Camp Stanley where it was absent.

71. ***Planesticus m. migratorius***. ROBIN. Rather uncommon, except at Medina Dam, where it was abundant in the juniper and bayberry.

72. ***Sialia s. sialis***. BLUEBIRD.—Not common except at Medina Dam.

73. ***Sialia currucoides***. MOUNTAIN BLUEBIRD.—A species whose appearance in this region was probably due to cold weather. Three birds seen December 17, and a male with *sialis* December 27, both at Camp Stanley. Lacey recorded it in only three winters in twenty-nine years around Kerrville considerably farther north and west. It is apparently previously unrecorded near San Antonio.

*Amer. Museum Nat. Hist., N. Y.*

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## THE OCCULT SENSES IN BIRDS.<sup>1</sup>

BY HERBERT H. BECK.

THAT animals below man, in the accepted biological line, have retained in efficient form much that has been greatly reduced or nearly lost in the process of developing Nature's master product — the human mind — is a fact of common knowledge. The senses of sight, smell and hearing in man are almost rudimentary when compared with the same senses as developed in the hawk, the setter dog, and the fox.

It is not so generally recognized, though none the less perhaps a fact, that certain senses widely or selectively a part of animal life, are absolutely gone in man. So thoroughly are these senses atrophied or lacking in the human mind that man with all his highly

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<sup>1</sup> Presented before the Delaware Valley Ornithological Club.

developed imagination cannot even vaguely visualize the subtle processes by which they operate.

In bird life one of these occult senses, the homing sense, exists to a remarkable degree. The complex phenomena of migration, often over trackless regions, the homing acts of pigeons, and the speedy returns over unfamiliar sea courses of Sooty Terns taken a thousand miles from their nests, cannot adequately be explained on the basis of acuteness of vision or persistence of memory in the birds that make these wonderful flights. There apparently is something entirely apart from human consciousness or subconsciousness that holds the bird to a true course between widely separated points.

The homing sense is broadly, though somewhat selectively, distributed among animals. It is exhibited by many insects and by some mammals. It only finds its greatest development in birds.

Nor is there anything supernatural about this seemingly occult faculty. It probably is only a common trait of animal life strongly carried through in certain groups. A highly efficient homing sense is but an example — like the keeled sternum in birds or the mind in man — of a well established principle of progressive evolution. The inordinate development in selected species of organ or sense common to many is a course so regular in nature that it cannot be considered an irregularity.

Akin to this homing sense and operating in a way equally intangible to man there exists, in all probability, a food finding sense. Widely distributed and occasionally highly specialized within several lower groups, notably the insecta, the food finding sense has persisted in only a limited way among vertebrates. There is little evidence that it exists among mammals. It is somewhat broadly a part of bird life; and among birds it seems to be most highly developed in the carrion feeders.

In many species of birds doubtless only an adjunct to activity in ranging or acuteness of vision, the food finding sense — at least on the basis of strong presumptive evidence — is so highly developed in certain individuals among these carrion feeders that it can act independently of the known senses.

Many of the writer's observations on food finding in Turkey Vultures have been insufficiently explained by the common theory that these birds are directed to their food by the senses of sight or

smell. But the most striking observation — and the one which most strongly leads him toward a belief in a definite food finding sense — is an incident the facts of which are as follows:

At daybreak, January 1st, two hunters, one of them the writer, were out with their pack of foxhounds in the farming valley of the Little Conestoga south of Lititz, Lancaster County, Pa. The bottom was bare of snow though it was gray white with a heavy frost. The morning was quiet, practically windless, and the temperature was about 28 degrees — just cold enough to keep the ground firm. The scene had in it all the charm that attends starting a fox at winter sunrise. The voices of the hounds on the twisted night track were rapidly going up toward the happy burst that would tell of jumping the fox — when something went wrong. The music changed its tone and the younger hounds began to straggle in toward the horses; and then with the rest of the pack, and striking right and left among the hounds, came the cause of the breakup — a mad dog.

To borrow a gun, kill the dog, and throw his carcass into a limestone sinkhole was the work of about half an hour. It was then nine o'clock. Three hours later, at the request of a local veterinarian who wished to examine the dog, I returned to get the carcass. As I neared the hole two vultures climbed out and flapped away. They had been at the dog evidently some time for the flesh about the hams was much eaten away.

There were two unusual features in the situation which, as the mind dwelt upon them, made the presence of those vultures in the sinkhole most impressive if not uncanny.

The first of these was that there was no winter camp of the vultures nearer than the southern slope of the South Mountain — eight miles north of the spot. This roost, above the Speedwell-farms, always had fifty to a hundred birds about it and the vultures apparently stayed near the South Mountain. I have rarely, if ever, seen vultures ranging in the Little Conestoga valley during the winter, before or since the incident.

The second was that the dog was invisible from any part of the sky. The sinkhole was six or seven feet deep with an opening of about three feet. The shaft, inclined toward the south, went down at an angle of about 45 degrees and the walls were so irregular with

projecting rocks and soil that the carcass at the bottom was completely hidden from view.

Under the existing conditions it is difficult to account for the finding of the carrion by either eye or nose sense in the vultures. The dog being invisible and there being no vultures in the neighborhood when it was thrown into the hole, sight could scarcely have been involved; and the possibility of a freshly killed dog at the bottom of a six foot hole giving off enough scent in midwinter to attract birds miles away is out of the question, even after eliminating the fact that the sense of smell is but poorly developed generally among birds.

Assuming the correctness of the theory of a food finding sense as it exists to-day in certain species, the imagination naturally runs back to the earlier stages in the evolution of these species. Given by Nature the right to life — if life can be maintained, and the first essential of continued existence — food, it is perhaps logical and it is certainly well supported by analogies, that chance superiority in food finding would develop into something of permanent value in the species, and that the sense thus evolved would be the determining factor of survival among a host of related forms many of which succumbed in the struggle for existence. And it is reasonable too that this food finding sense should have been most highly evolved, during centuries of wide spread forest areas, and that it should have persisted up to the present times, in those species which were high soaring and carrion feeding; for logically, among the raptorial where hunting and killing powers were lacking, subsistence depended upon food that must have been, almost invariably, concealed as well as fortuitous.

Again assuming that two leading essentials for the maintenance of the species — finding food and finding the home — had been assisted by specialized senses, it should follow that the third prominent factor — mating — had been similarly safeguarded.

While there is no convincing evidence at hand in support of a definite mate finding sense among vertebrates, there are many baffling incidents of field observations which would find explanation in such a theory.

In insect life however there is evidence which if not conclusive is strongly contributive. Thus a common wasp — *Pelecinus* —

has been known and collected almost invariably in the female form. Specimens taken are always fertilized. Apparently rare to a mysterious degree the male wasp has seldom been collected or observed. A well known entomologist conceived the plan of rearing a female *Pelccinus* from the pupa. Properly caged the virgin wasp was placed out of doors. Within a few hours the screens of her cell were swarming with the mysterious male of her species. These wasps may have been guided by some highly refined phase of a well known sense, but it seems unlikely.

Unfortunately research on these occult senses is difficult — often impossible. Theories have to be based upon analogies and chance observations. Under these conditions chance observation must assume a somewhat greater significance than ordinarily is placed upon it.

On the basis of some impressive though fragmentary evidence then we are justified in assuming — at least as an attractive and perhaps stimulating working hypothesis — that intimately interwoven with the life histories of thousands of animal species of past ages and many species of the present day there is an active sense which may be called occult simply because it is hidden from the experience and understanding of man. This occult sense, involving direction, has taken three phases as developed by the prime necessities of life — food, mate and home in their relations to space. The purely defensive or offensive elements that have determined survival have evolved chiefly along physical and chemical lines in animals and finally along mental lines in man. All phases of the occult sense have long since been lost in the channels of life that progressed toward civilized man; they exist only selectively in animals below man to-day; but they are still an important factor of existence in many life forms, as they have been a potent determinant in past ages.

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